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High-Specification Dairy Ingredients

Increasing Export Opportunities by Reducing Spore Formers in Milk powders

The Dairy Practices Council
47th Annual Conference
November 10, 2016

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WHO WE ARE

- Founded by Dairy Management Inc.
- Mission: grow value and volume
- Help U.S. suppliers improve their competitiveness

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Representing U.S. Dairy Around the World

1. China
2. Hong Kong
3. Europe
4. Japan
5. Mexico, including Central America
6. Middle East & North Africa
7. South America
8. South Korea
9. Southeast Asia
10. Vietnam
11. United States (HQ)

Building global demand for U.S. dairy products
Understanding market and identifying opportunities

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Programs: Support Sales and Reduce Risk

- **Trade Policy** – Improve the rules of trade & trade agreements – Get us into markets
- **Market Access** – Knowledge of the ever-changing market requirements – Keep us in markets
- **Strategy & Insights** – Provide U.S. suppliers with tools to know, meet & compete for customer's needs
  - Market insights
  - Improve U.S. product supply portfolio
  - Improve supply chain logistics
- **Global Marketing** - Increase demand via customer education & "Why U.S. Dairy" messaging
- **Issues Management & Crisis Preparedness** – Strengthen industry response systems to potential export-related crises

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Go-to Source for Information

Customer Home Page:
ThinkUSAdairy.org

Member Home Page:
usdec.org

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Exports are Important to the Health of the U.S. Dairy Industry

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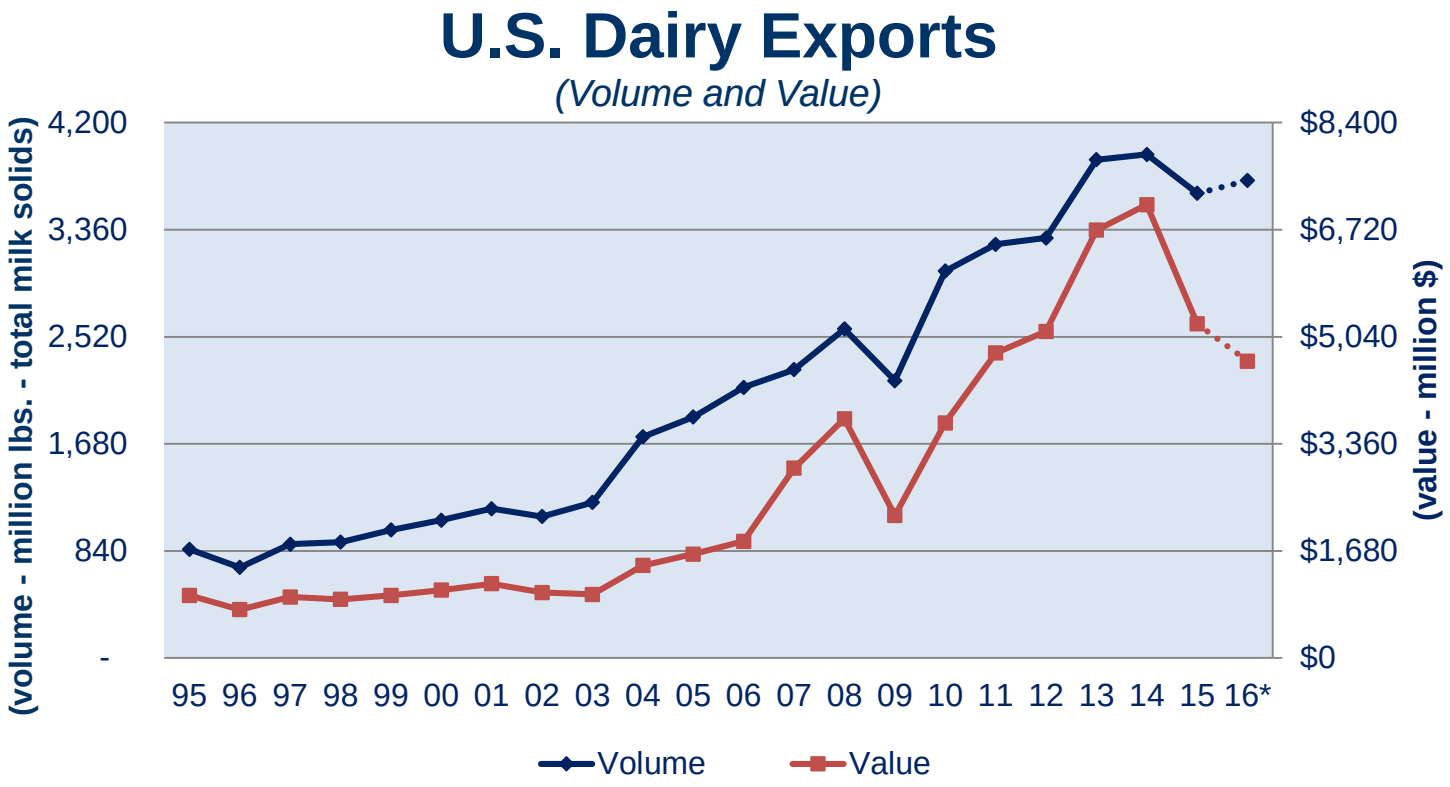
Exports (by Volume) on Track to Increase in 2016



* 2016 USDEC projection. Source: USDEC, USDA.

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Export Reliance Spreads to Specific Products

U.S. Exports as % of Production

Product	Thu Sept 2016	2015	2014	2013	Avg. '04 –'08
Butterfat	2.5	2.6	8.4	10.7	4.4
NDM/SMP	56	55	52	58	42
Dry sweet whey	42	40	58	55	42
Lactose	72	75	67	72	56
Cheese	5.1	6.0	7.1	6.3	1.9
Total Solids	**13.9**	**14.0**	**15.3**	**15.5**	**9.2**

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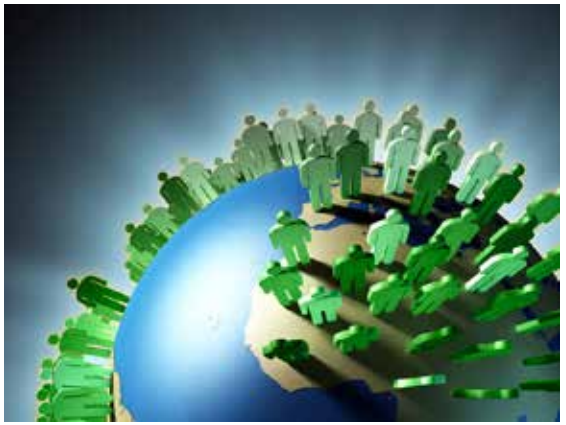
Outlook for Global Dairy…

- Forecast remains positive, the market fundamentals remain strong
- Growth prospects are driven by economic and population dynamics in developing countries
  - Rising income will continue to expand dairy consumption and demand for dairy protein

"This expansion continues. The size of the 'global middle class' will increase from 1.8 billion in 2009 to 3.2 billion by 2020 and 4.9 billion by 2030."

Mario Pezzini
Director, OECD Development Centre



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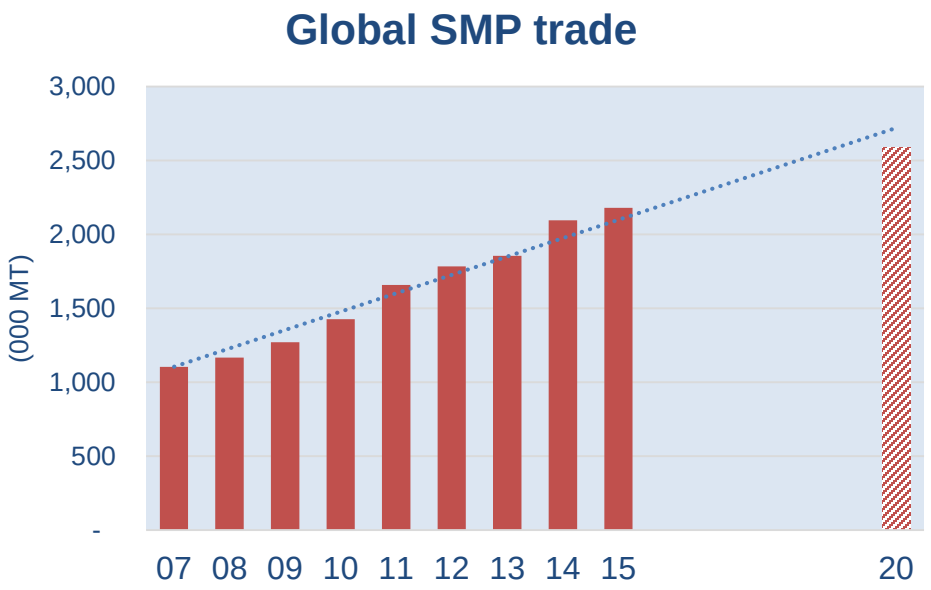
SMP Presents a Good Opportunity

- Global SMP trade was 2.2 million tons in 2015
  - Trade grew 8.9% per year between 2007 and 2015
  - If total SMP imports grow by just 3.6% per year to 2020, that's an additional 420,000 tons



Source: USDEC, Global Trade Atlas

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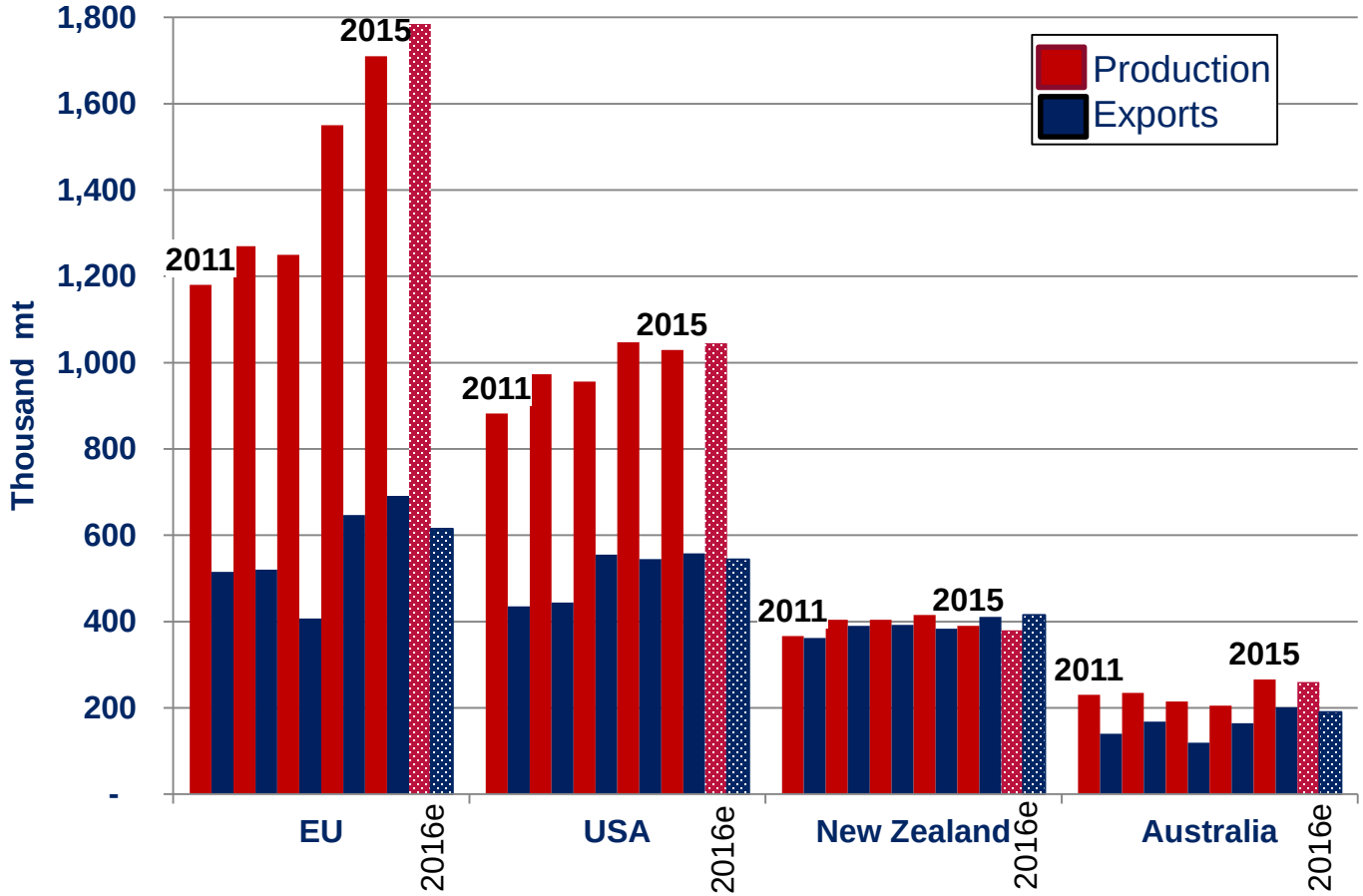
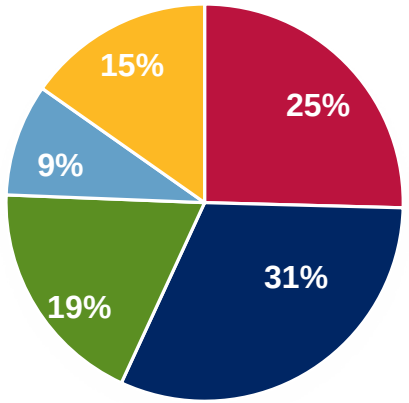
2011-2016e SMP/NDM Production & Export



2015 Global trade ~2.2 million mt

Share of Global SMP Exports, 2015



Source: USDA November 2016; Global Trade Atlas and USDEC estimates.

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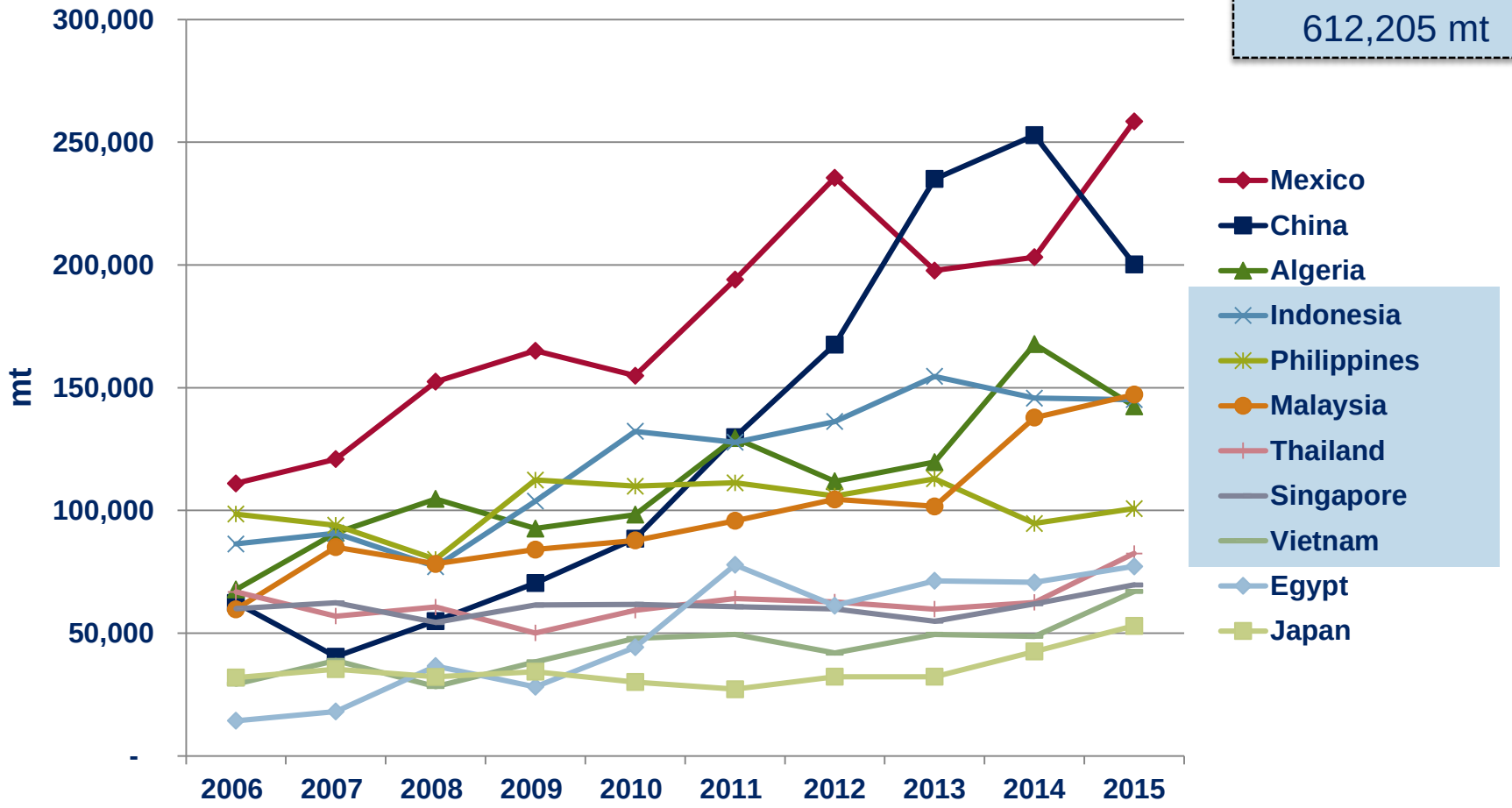
Key Global SMP Import Markets in 2015

2015 SEA
612,205 mt



Source: Global Trade Atlas; Vietnam (series) and 2015 Algeria are estimates

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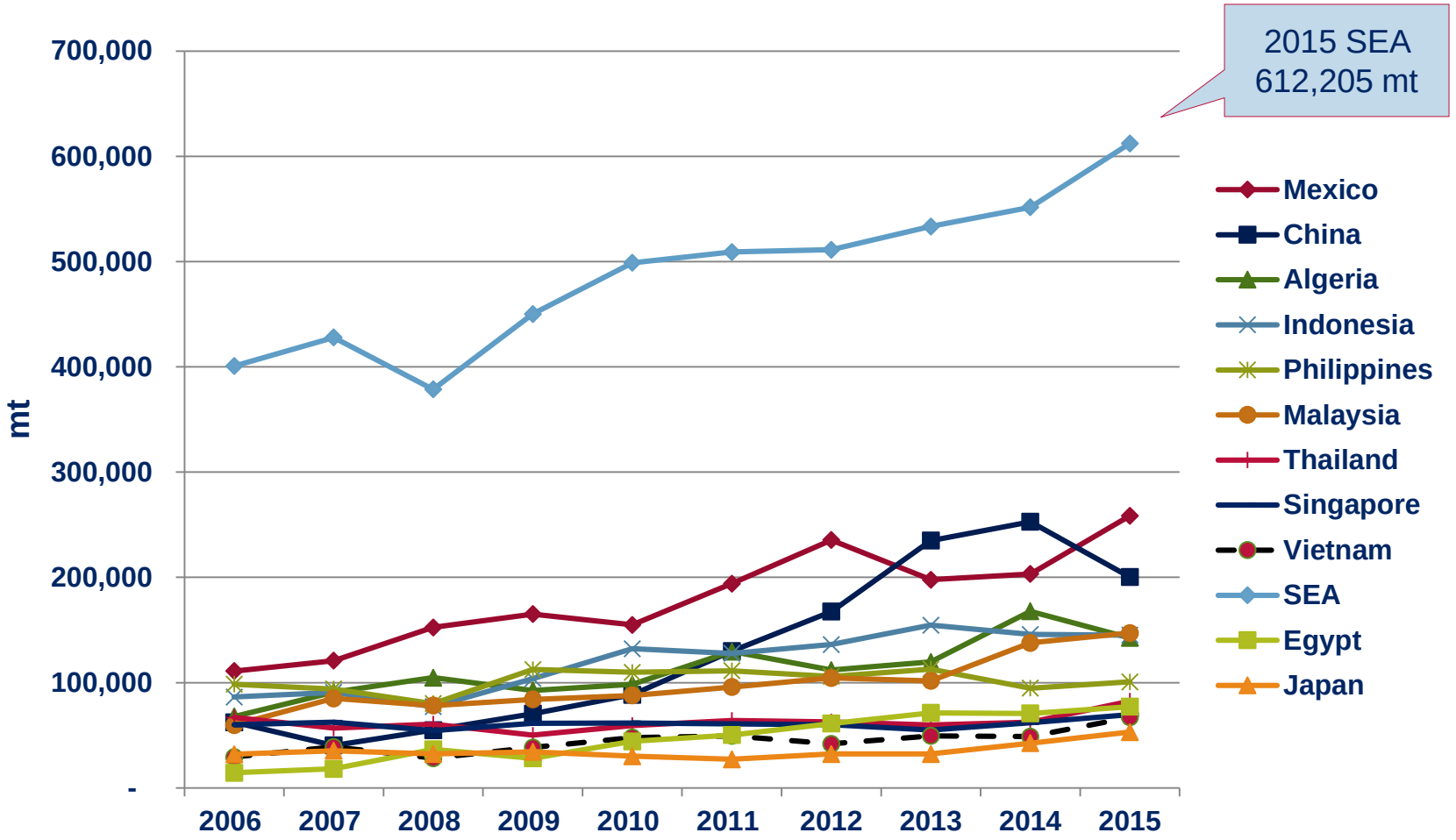
Key Global SMP Import Markets in 2015



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Opportunity for U.S. Milk Powder Suppliers

- Emerging markets – China & SE Asia
- Applications: - Infant formula and nutritional beverages
  - Recombining industries & UHT dairy beverages
- Demand for these products continues to rise
  - Consumer purchase impacted by
    - Income
    - Food safety concerns
- Major suppliers unlikely to fill expected demand
- Growing number of processing facilities
  - Manufacturers want to diversify supply risk
    - Looking for U.S. supply?

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Buyers are Looking for High-Specification Dairy Ingredients that Meet Their Needs

- Low-spore
- SMP vs. NDM
- Heat-stable
- Low nitrite/nitrate
- Low benzoic acid
- Low Aflatoxin M1
- Free flowing
- Good solubility
- Good flavor
- Color / Scorched particles
- Consistent micronutrients

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End-Users are Concerned About Spores

- Top of mind request
- Buying specifications are set considering the process' ability to grow and/or inactivate spores
- Spores that remain viable in products will impact shelf life, quality and safety

Spores limit the ability to use U.S. powders in "more demanding" applications

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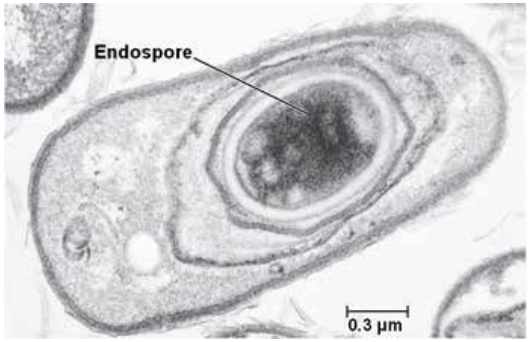
What are Spores (Bacterial Endospores)?

- A spore is a dormant cell type
- Extremely resistant to environmental challenges: heat, desiccation, radiation, chemicals, acids, and drying
- Retains the ability to monitor its environment and to germinate and resume vegetative growth within minutes of exposure to specific germinant conditions (i.e. nutrient, heat)



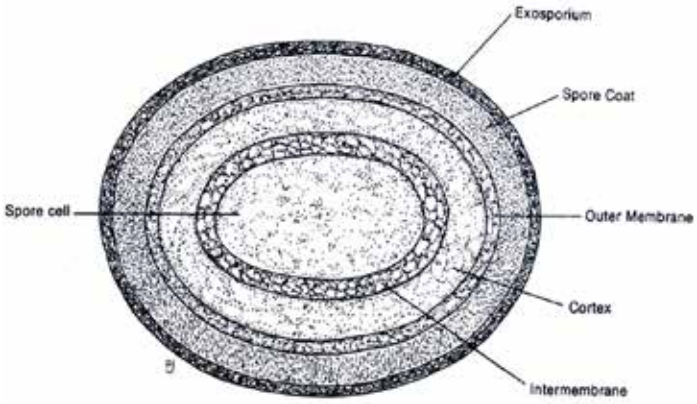


Fig. 8.1. Endospore

So many different types of spores…

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How do Spores End Up in Powders?

- On-Farm / raw milk
  - Ubiquitous
  - Major habitat: soil
  - Feed and bedding: contaminate udder and teats
  - Milking practices
  - Dirty or poorly maintained milking equipment
- In-Plant
  - Biofilm (surface)
  - Not fully eliminated by CIP
  - Dead-end, low flow
  - Processing sites operating at 45-60^{o}C (113-140^{o}F)
    - Regeneration section of pasteurizers
    - Preheater and evaporator, everywhere after 9-18 h in manufacturing run. (Scot, 2007)

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So… to Seize the Opportunity

- Understanding buyer's needs
- Change… our portfolio, culture & approach
- Consistently deliver ingredients that meet specifications, requirements, and perform in applications

THE ROLE OF THE DAIRY COMMUNITY

- Know your products –
  - Not just protein and fat but micro and macro nutrients
  - Seasonal variations
- Know the functional characteristics
  - Foaming, solubility, protein denaturization, age related characteristics, etc.
- High value ingredients require high value understanding

Source: Elizabeth Riordan, Abbott, The IDF World Dairy Summit 2016

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Why Invest in Spore Control?

- Competitive advantage
- Minimum-entry requirements to supply large volume and growing sectors:
  - Infant formula, nutritional products, recombined dairy products, UHT dairy beverages
- End-user quality requirements and expectations will continue to increase in a world where safety and performance are key
- To become a “choice supplier”
- Our competitors work to minimize spore-levels

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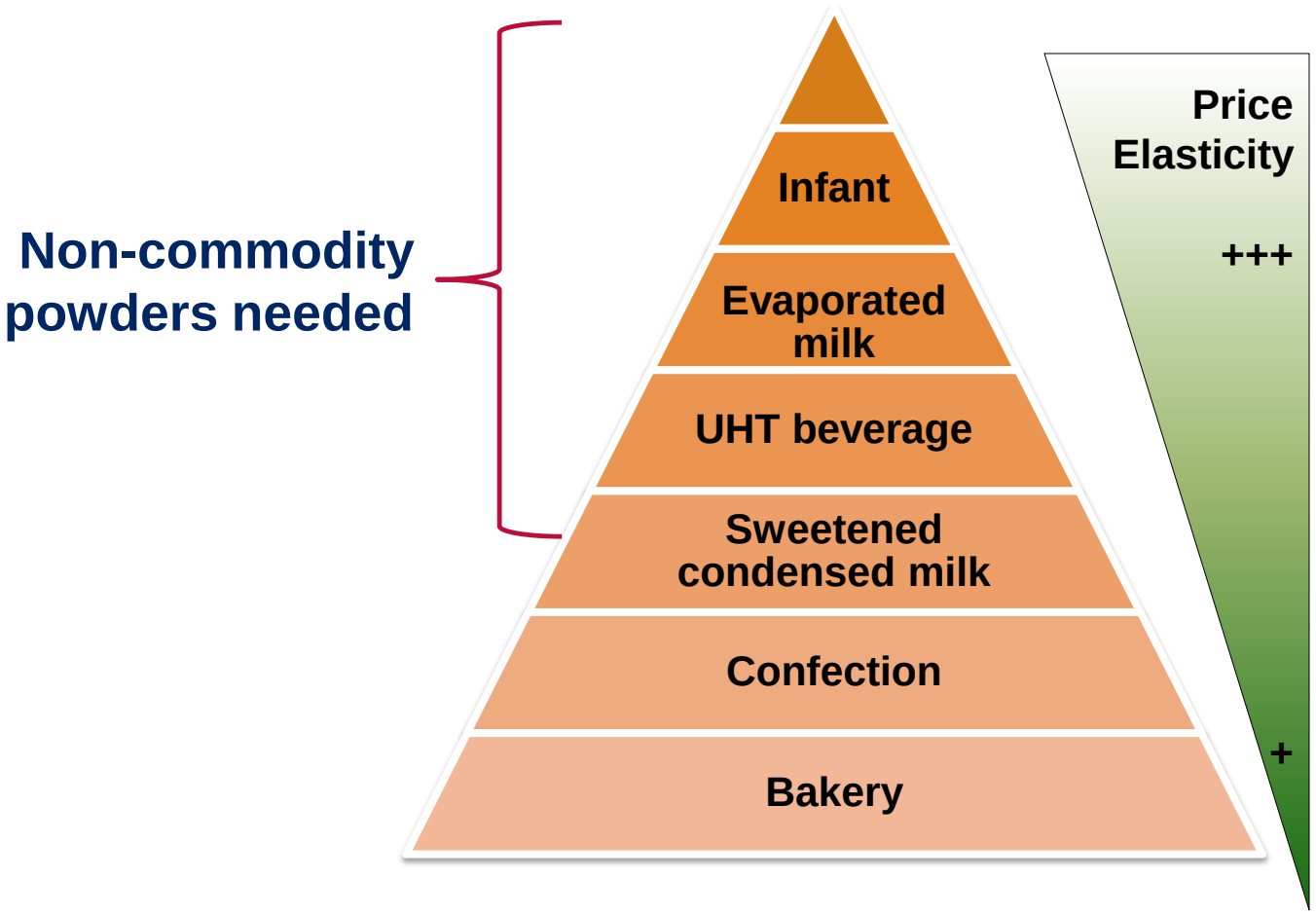
Stronger Position for U.S. Supply



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Spore control demands a sustained effort throughout the milk production chain from farm to powder

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U.S. Industry Invests in Spore-Control

USDEC/NDC Milk Powder Quality Improvement Plan

- Support industry's effort to consistently meet tight specs
- Identify gaps: deliver/develop knowledge

Areas of Work
On-farm practices
In-plant practices
Cleaning practices
Biofilm prevention
Process technology to eliminate spores
Faster spore detection
Global testing procedures

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Significant Progress in Developing Science Based Solutions & Driving Adoption

- Funded 5 years of research at the U.S. Dairy Centers
- Part of International Spore Testing Consortium

- Visited suppliers and end-users to learn best/new practices
- Engaged experts to quickly deliver solutions via plant audit

- Reference-publications
  - Literature review
  - Best practice manual
- Spore Seminars (Feb 2013, Sept 2014, Feb 2016)
- Presentations at multiple U.S. industry meetings

Efforts amplified by Partners: State & regional's and companies are also funding spore research

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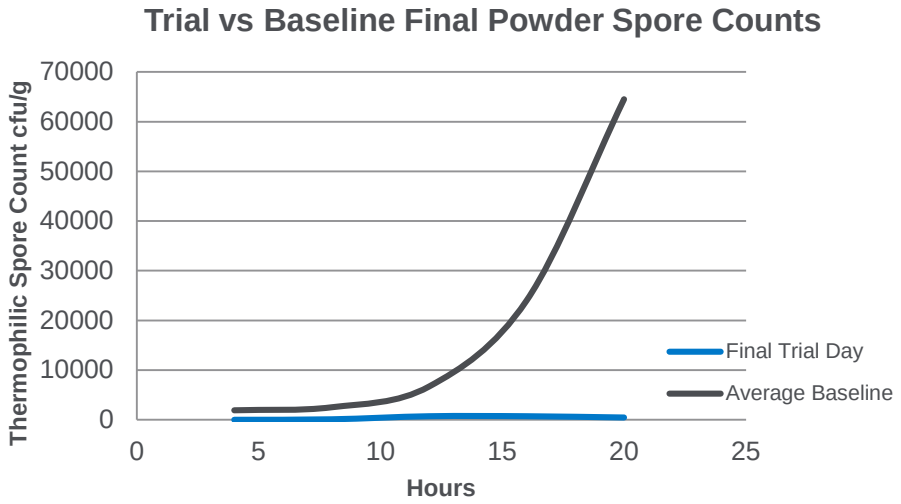
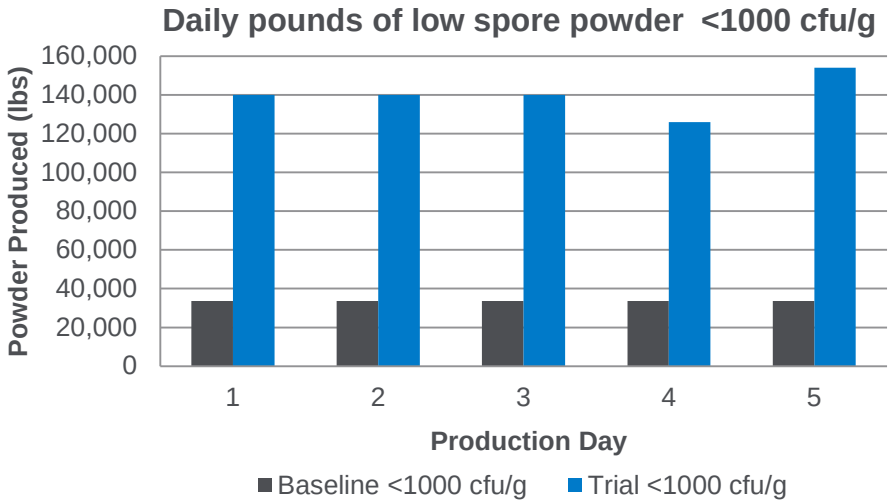
Better Equipment Cleaning Allows Manufacturers to Produce More Low Spore SMP/NDM

- New CIP program which uses additional detergent and sanitizers - results show significant improvement in cleaning
- Trials produced 20 hours of <1000 cfu/g NDM
  (Wisconsin/Ecolab study)





ECOLAB

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Reviewing Product Specification?

Be mindful of the test method used
Variation between test methods may influence results

- Testopedia, the USDEC Test Methods Database
  - Collection of test methods used in other countries
  - Helps reduce trade risks and improves communication with customers
  - Tool exclusive to USDEC members
- Spore testing
  - Several methods in used - Lack of clarity if not on spec. sheet
  - Test method used will impact spore count
  - Biased perception
  - False sense of product superiority/inferiority

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In Summary

- Long-term forecast: consistent dairy demand growth
- To supply top-tier uses and customers, we need to meet low-spore/high-quality specifications and become top suppliers
  - Historically the U.S. has not been the “first choice” supplier - we need to change this opinion
- U.S. industry is changing, more companies are focusing on low-spore/high-spec - still, larger volumes are/will be needed

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Key to Success

- Build long term/lasting relationships
  - Be responsive
  - Follow cultural customs (interpersonal skills)
  - Understand end-use and rational for buyers' ask
- Must deliver ingredients that
  - Meet buyers' specifications
    - be mindful of the test method
  - Consistently perform
  - Deliver a high-quality finished product

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Thank you!

We want to accelerate the U.S. industry's success to attain low-spore milk powder goals

- **How can we help you?**
- **How can you help us?**

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